epidermal, and both intercellular and intracellular. In the protocorm "it seems to be always present in an intercellular position in the central tissues." The demonstration of the fungus in this structure inclines the author toward "BOWER'S suggestion" concerning the phylogenetic importance of the protocorm. The most interesting thing to the reviewer is HOLLOWAY'S discovery that the germinating spore sometimes develops a filament before the "primary tubercle" stage of TREUB is reached. This fact throws some light upon the phylogenetic history of the *Lycopodium* prothallium.

In a discussion of the cause of such a variety of form in the prothallia of *Lycopodium* and *Tmesipteris*, the author says "One cannot avoid the suggestion that the dominating factor . . . . is the presence of the fungus." He suggests that the primary tubercle may be a secondary growth rather than a primary one.—E. A. SPESSARD.

**Wilting coefficient studies.**—Considerable surprise was expressed at the announcement by BRIGGS and SHANTZ of the "wilting coefficient" as an important critical factor in the relation of soil moisture to the plant, and at their statement that the wilting coefficient was practically the same for all classes of plants and showed little or no variation in response to atmospheric changes. Many seemed to doubt the accuracy of these statements, and several unsuccessful attempts were made to demonstrate a relationship between the evaporating power of the air and the wilting coefficient. SHULL[12] showed rather conclusively that the wilting coefficient is a function of the movement of water in the soil rather than a lack of gradient of forces tending to move the water toward the plant. As a function of the soil finding an expression through plants, rather than a function of the relationship of the forces exerted by the plant, it does not seem surprising that the wilting coefficient is much the same for all plants and for all atmospheric conditions.

Attacking the problem from a somewhat different angle, LIVINGSTON and KOKETSU[13] show even more conclusively that the wilting coefficient is a function of water movement in the soil. These workers made use of small porous porcelain cones or "soil-points" which, while dry, were thrust into the soil. At the end of a suitable period they were withdrawn, and by weighing the amount of water absorption was determined. The data obtained indicated that at permanent wilting the water supplying power of the soil was the same for the different plants used and also for different soils within certain limits. They regard this present report a tentative and preliminary one, but in the soil-point method there seems to be much promise of a complement to the porous cup atmometer investigations of the moisture conditions of the atmosphere.—GEO. D. FULLER.

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[12] SHULL, C. A., Measurement of the surface forces in soils. BOT. GAZ. 62:1–29. *figs.* 5. 1916.

[13] LIVINGSTON, B. E., and KOKETSU, R., The water supplying power of the soil as elated to the wilting of plants. Soil Science 9:469–485. 1920.